

REMARKS

Status of the Claims

Claims 13-23 and 25-26 are presented. Claims 13-23 and 25 are amended. Dependent claims 14-23 and 25 are amended for clarity to recite "The process" rather than "A process". Claim 13 is amended to specifically include the rectifying column attached to the top of the reaction column, and the removal of water and excess volatiles through the rectifying column. Support is found throughout the specification. No claims are cancelled. No new claims are added.

No new matter has been introduced.

Summary of the Invention as Claimed

As currently amended, one aspect of the invention is drawn to a countercurrent process for the continuous esterification of fatty acids with mono- di- or trialkanols or mixtures thereof, comprising (a) partially reacting the fatty acids and alkanols in a preliminary reactor in the presence of a heterogeneous catalyst selected from the group consisting of organic or inorganic, basic or acidic, anion or cation exchangers, acid clays and zeolites, (b) passing the partially-reacted reaction mixture to a separation unit, (c) removing water from the partially-reacted reaction mixture in the separation unit, (d) passing the de-watered, partially-reacted reaction mixture to a countercurrent reaction column with attached rectifying column on top, (e) further reacting the fatty acids and alkanols in the presence of heterogeneous catalysts, (f) removing the water and excess volatile components through the rectifying column, and (g) removing the crude product from the bottom of the reaction column.

Rejections under 35 U.S.C. § 103(a)

Claims 13-23 and 25-26 were rejected under 35 U.S.C. § 103(a) as being

unpatentable over Kahsnitz et al (US 5,177,229; "Kahsnitz") in view of Bremus et al (US 5,008,046; "Bremus") and Aslam et al (Kirk-Othmer Encyclopedia of Chemical Technology, vol. 10, 12/4/2000, p. 477; "Aslam").

Kahsnitz discloses a process for the preparation of esters from alcohols and acids using ion exchangers as catalysts in an apparatus comprising a prereactor, a rectifying column and multiple external reactors, wherein the middle plates of the rectifying column are used as a feed for the external reactors, as well as a return from the external reactors. As acknowledged by the Examiner, the described process is neither counter current nor continuous, in contrast to applicants' process. In addition, the Examiner acknowledged that applicants' process differs from that of Kahsnitz in that after the preliminary reactor, applicants' subsequent esterification between the fatty acids and alkanols takes place in a reaction column with a rectifying column attached, in the presence of the catalyst.

In order to overcome these deficiencies, the Examiner added Bremus, which discloses a continuous, countercurrent process for esterification of fatty acids, which does not disclose a prereactor, and in which a homogeneous catalyst stream is added to the reactor column fitted with a rectifying column, together with fatty acid and alcohol reactant streams, as opposed to applicants' heterogeneous ion exchange catalyst. A separator and an additional rectifying column after the main reactor allow separation of water and recycling of streams back to the reactor column.

The Examiner also added Aslam to show the equivalence of various heterogeneous and homogeneous catalysts with regard to esterification reactions.

However, it is respectfully pointed out that the configuration of Applicant's

process is unique. After passing the acid and alcohol reactants through the prereactor (step (a)), applicants specifically remove water from the partially-reacted mixture using a separation unit (steps (b) and (c)), before feeding into the main countercurrent reactor with attached rectifying column on top (step (d)). This is specifically done to create a favorable equilibrium for continuing the esterification reaction in the main reactor (step (e)), as disclosed in the specification on page 4, lines 23-30. Thus steps (b) and (c) are unique in the process sequence. None of the three combined references cites a water separation step prior to the main reaction. Therefore applicants' process is unobvious over the cited combination of references.

Conclusion

In summary, in view of the above claim amendments and remarks, applicants believe that the pending claims as amended are in condition for allowance. The Examiner is respectfully requested to reconsider, withdraw the rejections and allow the claims.

If any additional fees are required in support of this application, authorization is granted to charge our Deposit Account No. 50-1943.

Respectfully submitted,

February 3, 2009

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